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CLAIMS

1. Apparatus for filling bags (1) with loose material (2), comprising a tube (210) for supplying the material (2), substantially coaxial with the said bag (1),  
5 characterized in that said tube (210) is able to move from a position with the supply mouth (210a) outside the bag to a position with the supply mouth (210a) inside the bag (1) and arranged at a height substantially coinciding with the bottom (1b) of the  
10 bag (1) where filling is started, and vice versa.
2. Apparatus according to Claim 1, characterized in that it comprises means (112) for retaining the bag (1) at a fixed height.  
15
3. Apparatus according to Claim 1, characterized in that the top end of the tube (210) is integral with a hopper (211) containing the product (2).
- 20 4. Apparatus according to Claim 1, characterized in that it comprises means for displaceably actuating it in both directions along a vertical axis (Z).
5. Apparatus according to Claim 4, characterized in  
25 that said actuating means (200) consist of a motor (231) connected, by means of transmission means, to a frame (232) integral with the hopper (211).
6. Apparatus according to Claim 5, characterized in  
30 that said means (230) for displaceably actuating the frame (232) are of the variable/controllable speed type.
7. Apparatus according to Claim 1, characterized in  
35 that it comprises means for weighing the product (2).

8. Apparatus according to Claim 7, characterized in that said means for weighing the product (2) are arranged upstream of the said supply tube (210).

5 9. Apparatus according to Claim 1, characterized in that it comprises means (500) for weighing the bag (1) during filling.

10 10. Apparatus according to Claim 9, characterized in that said weighing means (500) consist of load sensors (501) connected to the bag retaining means (112).

15 11. Apparatus according to Claim 1, characterized in that the mouth (210a) supplying the product (2) is equipped with rotating plates (210b) able to be arranged transversely with respect to the mouth (210a) of the tube, so as to cause closing thereof, and, parallel thereto, so as to cause opening thereof.

20 12. Apparatus according to Claim 1, characterized in that it comprises means (240) for measuring the volume of the product (2) to be introduced into the bag (1).

25 13. Apparatus according to Claim 12, characterized in that said volume measuring means consist of a feeder screw (240) coaxially arranged inside the tube (210) and able to convey measured quantities of product (2) from the hopper (211) to the bottom (1b) of the bag.

30 14. Apparatus according to Claim 13, characterized in that said feeder screw (240) is associated with variable speed actuating means with a system for control thereof.

35 15. Apparatus according to Claim 1, characterized in that it is associated with air and dust suction means

(300).

16. Apparatus according to Claim 15, characterized in that said suction means consist of longitudinal ducts  
5 (310) arranged in a diametral position with respect to the tube (210) and extending substantially along the whole axial length of the said tube.

17. Apparatus according to Claim 1, characterized in that it comprises deaeration means consisting of a  
10 plurality of pipes (1311), the bottom end part (1311a) of which is hinged with pins (1311b) able to allow expansion thereof in the transverse direction, by an amount corresponding to the width of the bag.

18. Machine for filling bags (1) with loose material (2), comprising at least one filling station (R) where there is a filling apparatus (200) comprising a tube (210) for supplying the material, substantially coaxial  
15 with the said bag (1), characterized in that said tube (210) is able to move from a rest position with the supply mouth (210a) outside the bag (1) to a position with the supply mouth (210a) inside the bag and at a height substantially corresponding to that of the  
20 bottom (1b) of the bag (1) where filling is started, and vice versa.

19. Machine according to Claim 18, characterized in that it comprises means (112) for retaining the bag (1)  
25 at a fixed height.

20. Machine according to Claim 18, characterized in that the top end of the tube (210) is integral with a hopper (211) containing the product (2).  
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21. Machine according to Claim 18, characterized in

that it comprises means (230) for displaceably actuating the filling apparatus in both directions along a vertical axis (Z).

5      22. Machine according to Claim 21, characterized in that said means (230) for displaceably actuating the filling apparatus consist of a motor (231) connected, by means of transmission means, to a frame (232) integral with the hopper (211).

10

23. Machine according to Claim 21, characterized in that said means (230) for actuating the frame (232) are of the variable/controllable speed type.

15      24. Machine according to Claim 18, characterized in that it comprises means for weighing the product (2).

25. Machine according to Claim 24, characterized in that said means for weighing the product (2) are  
20 arranged upstream of the said supply tube (210).

26. Machine according to Claim 18, characterized in that it comprises means (500) for weighing the bag (1) during filling.

25

27. Machine according to Claim 26, characterized in that said weighing means (500) consist of load sensors (501) connected to the bag retaining means (112).

30      28. Machine according to Claim 24, characterized in that the mouth (210a) of the tube (210) supplying the product (2) is equipped with rotating plates (210b) able to be arranged transversely with respect to the mouth (210a) of the tube, so as to cause closing  
35 thereof, and parallel thereto, so as to cause opening thereof.

29. Machine according to Claim 18, characterized in that it comprises means (240) for measuring the volume of the product (2) to be introduced into the bag (1).

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30. Machine according to Claim 29, characterized in that said volume measuring means consist of a feeder screw (240) coaxially arranged inside the supply tube (210) and able to convey measured quantities of product (2) from the hopper (211) to the bottom (1b) of the bag.

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31. Machine according to Claim 30, characterized in that said feeder screw (240) is associated with variable speed actuating means with a system for control thereof.

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32. Machine according to Claim 18, characterized in that it is associated with air and dust suction means (300).

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33. Machine according to Claim 32, characterized in that said suction means consist of longitudinal ducts (310) arranged in a diametral position with respect to the supply tube (210) and extending substantially over the whole axial length of the said tube.

25

34. Machine according to Claim 18, characterized in that it comprises deaeration means consisting of a plurality of pipes (1311), the bottom end part (1311a) of which is hinged with pins (1311b) able to allow expansion thereof in the transverse direction, by an amount corresponding to the width of the bag.

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35. Machine according to Claim 18, characterized in that it is a forming/filling machine.

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36. Machine according to Claim 35, characterized in that it comprises at least one station (F) for forming the bag (1) from a tubular material (101) unwound from a reel (101a), at least one station (R) for filling the bag with the material supplied by the filling apparatus (200), and at least one station (S) for sealing the mouth (1a) of the bag.

37. Machine according to Claim 35, characterized in that it comprises means (110) for conveying the bag from the forming station (F) to the filling station (R) and to the sealing station (S).

38. Machine according to Claim 37, characterized in that said conveying means consist of a slide (110) displaceably actuated with an alternating outward and return movement and equipped with facing pairs of grippers (110a) for gripping the bag along the opposite vertical edges thereof.

39. Machine according to Claim 38, characterized in that said slide is able to impart to the grippers (110a) movements in the direction transverse to the direction of feeding of the bag (1) so as to cause opening of its mouth (1a) during travel from the forming station (F) to the filling station (R) and closing thereof during travel from the station (R) to the sealing station (S).

40. Machine according to Claim 38, characterized in that the displacement movements of said slide (110) are at a fixed height.

41. Method for filling a bag (1) with loose material (2), characterized in that it comprises the following

steps:

- preparation of an apparatus (200) for filling bags (1) with loose products (2);
- preparation of a programmed quantity of material (2) to be introduced into the bag;
- conveying of a bag (1) into a position substantially coaxial with and underneath the filling apparatus (200);
- opening of the bag (1) and retaining thereof in said coaxial position and at a fixed height;
- introduction of the apparatus (200) inside the bag (1) as far as a predefined height in the vicinity of the bottom (1b) thereof;
- start of the first bag filling step;
- simultaneous return movement upwards of the apparatus (200) towards the mouth (1a) of the bag (1);
- termination of the filling step at a predefined height inside the bag (1);
- extraction of the filling apparatus from the bag (1).

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42. Method according to Claim 41, characterized in that conveying of the bag (1) is performed at a fixed height.

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43. Method according to Claim 41, characterized in that the speed of introduction/extraction of the filling apparatus (200) into/from the bag is different from the speed of its return upward movement simultaneous with the filling step.

30

44. Method according to Claim 41, characterized in that filling is performed by means of gravity.

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45. Method according to Claim 41, characterized in that the quantity of product (2) to be inserted into the bag is prepared using a net weight technique.



46. Method according to Claim 41, characterized in that the quantity of product (2) to be inserted into the bag is prepared using a gross weight technique.

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47. Method according to Claim 41, characterized in that filling is of the volumetric type.

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48. Method according to Claim 47, characterized in that filling is performed using feeder screw means (240) coaxially arranged inside the filling apparatus (200).

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49. Method according to Claim 41, characterized in that the filling operation comprises the following steps:

- start of a first bag filling step of the volumetric type;
- simultaneous return movement upwards of the apparatus (200) towards the mouth (1a) of the bag (1);
- termination of the said first volumetric filling step;
- start of a second filling step using the gross weight technique until the final programmed weight of the bag is reached;
- extraction of the filling apparatus from the bag (1).

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50. Method according to Claim 49, characterized in that the speed of supply of the product (2) during the first filling step is much greater than the supply speed during the second filling step.

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51. Method according to Claim 49, characterized in that the first volumetric filling step is performed using feeder screw means.

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52. Method according to Claim 41, characterized in

that it comprises dust and air suction during the bag filling step.

53. Method according to Claim 41, characterized in  
5 that conveying of the bag (1) underneath the filling  
apparatus (200) is performed by means of conveying  
means forming part of an automatic machine.

54. Method according to Claim 53, characterized in  
10 that said conveying means consist of a slide (110).

55. Method according to Claim 54, characterized in  
that said slide (110) is displaceably actuated with an  
alternating outward and return movement and is equipped  
15 with pairs of facing grippers (110a) for gripping the  
bag along its opposite vertical edges.

56. Method according to Claim 54, characterized in  
that said slide (110) is able to impart movements in a  
20 direction transverse to the direction of feeding of the  
bag (1), so as to cause opening of its mouth (1a)  
during travel from the forming station (F) to the  
filling station (R) and closing thereof during travel  
from the station (R) to the sealing station (S).

25  
57. Method according to Claim 53, characterized in  
that said automatic machine is a forming/filling  
machine.

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